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Report
Mobile network sharing and fixed-mobile convergence in Switzerland

Study for the Federal Office of Communications (OFCOM)
and the Federal Communications Commission (ComCom)

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Management Summary

This study is intended to provide an information base on network sharing in mobile radio networks and provides assessments based on regulatory economics how the regulatory authority can make the relevant balance between economically desirable cost savings, reduction of the impacts on the population and the environment on the one hand side, and competition implications of network co-operation on the other hand side which could be unfavourable, in order to decide on individual forms of operator co-operation and its intensity. The study also highlights the increasing convergence of fixed networks and mobile networks.

The study starts from a broad definition of network sharing. The classic forms of mobile network sharing relate to the joint use of passive and/or active network elements. This applies in particular to the joint use of access network infrastructures. Joint use of network infrastructure may, but does not have to, include shared use of frequencies. Although in the case of roaming only the (respective) elements of a network are used, this form of co-operation is in the end equivalent to network sharing. Since the network is defined less by the physical hardware, sharing may also refer to software-determined network functions. The most extensive use of a third party network is in the form of an MVNO relationship.

Market trends and regulatory trends in network sharing

Our assessment of network sharing, which is based on the economics of regulation, and our recommendations in relation to Switzerland are also substantially based on the findings of an analysis of international trends concerning regulatory practice and the market reality of network sharing. To this end we have worked through a series of case studies including recent merger decisions relating to the mobile market by the European Commission. In summary, we have derived the following conclusions from this:

1. Passive network sharing is an almost universal reality in the market. This form of network sharing is welcomed without any reservation, promoted and sometimes even required by the regulatory authorities.

2. Most regulatory authorities also support active sharing of the Radio Access Network (RAN) and have established appropriate supporting regulations.

3. However, in the market reality there are only a few examples of comprehensive RAN sharing. These are typically implemented in firmly structured joint ventures of the operators involved.

4. From this we conclude that multifaceted and restrictive conditions are not conducive to RAN sharing. Regulatory authorities committed to opening up this option for operators and thereby enabling to realise the associated cost savings, must take a liberal approach regarding the conditions and restrictions of RAN sharing.

5. Core network sharing does not occur in the market. Regulatory authorities also regard this form of sharing with considerable scepticism and reluctance. In this case they no longer see sufficient options for competitive service differentiation. This also corresponds to our assessment.

6. Most regulatory authorities reject joint use of frequencies or only permit this option to stringent conditions at the "edges" of the network. However, frequency pooling is a market reality in

Denmark and Sweden. Competitive performance and performance for end-users in the Swedish mobile market is remarkable in a direct comparison with Switzerland. Sweden has the most intensive network sharing in Europe, whereas in Switzerland it is limited to passive sharing. The distribution of market shares and the HHI index suggest more intense competition in the Swedish market than in the Swiss market. Network coverage in Sweden is at least as high as in Switzerland. However, end-user prices in Sweden are distinctly lower than in Switzerland and overall market performance in Sweden is therefore better.

7. National roaming is a form of network sharing which is well established in the market. The agreements are usually closed through commercial negotiations. Particularly in situations of market asymmetries, primarily in terms of market entry, regulatory authorities assess national roaming positively. In many cases roaming is also imposed by regulators. However, with regard to roaming, regulatory authorities generally provide restrictions in terms of time and/or extent.

8. In some countries national roaming is also seen as an opportunity to assure communication in the event of individual operators' network failures. We regard this as an option worthy of consideration.

9. Currently, the virtualisation of network functions up to network slicing is yet to become a reality in the market. However, conceptual design and standardisation are progressing at such a pace that regulatory authorities must expect that these concepts will become a market reality with the advent of 5G networks at the latest. All concerns relating to competition policy applying to network sharing are also relevant here. Regulatory authorities must ensure, even in case that non-network operators take over the control of network functions, that regulatory control options are retained, e.g. by amending the definition of an operator.

10. In so far as MVNOs enjoy sufficient competitive freedom, they can promote and intensify competition in (heavily) concentrated mobile markets. By analogy with the merger case, in cases of comprehensive network co-operation, regulatory authorities can and should impose an MVNO obligation as a condition for the co-operating partners.

Cost savings through network sharing

The main economic driver for network sharing is realising cost savings in network construction and operation. These savings are not only beneficial in terms of business economics, but also concerning the national economy. Regulatory authorities therefore require a clear picture of the extent of the cost savings which can be realised through network sharing.

With the aid of a generic analytical bottom-up LRIC costing model which has been adapted to the conditions in Switzerland we have analysed different scales of approaches to sharing in terms of their essential effect on costs.

For this purpose, we have parameterised a model which takes into account not only 2G and 3G, but also LTE technology up to Release 10 with the characteristic traffic behaviour of central Europe and the population distribution in Switzerland. The model takes into account the frequency spectrum which is currently assigned to the Swiss mobile operators. With its network planning tool the model in a first step determines the systems, a network operator requires for the intended network coverage meeting the demand. This includes all components of a mobile network, starting with the antenna sites and their radio equipment, through the backhaul and core network locations, to their functions for user and

service management, the IMS and the gateways to other networks. After determining the necessary network elements in terms of number and capacity, in a second step the production costs of such a network are calculated using current market data. The costs per year of operation are determined, among other things, by writing off the necessary investment and by determining the operating costs of the network.

For Switzerland, typical market shares have been used for the size of the networks; for the simulation of different sharing options these market shares were then also combined and the costs of joint operations were determined.

In accordance with the bottom-up modelling approach, the model results of co-operation are always subject from the outset to the construction of a joint network (the "greenfield" sharing view). In the case of existing networks, the calculated savings of co-operation would therefore only apply in the long term, i.e. to the extent that the network structures can be adapted and the old elements which are no longer required are excluded from the amortisation and the associated costs.

The model results indicate that site sharing demonstrates the largest relative saving effect, followed by RAN sharing, whilst the additional contribution from full roaming (or core network sharing) turns out to be relatively low. Depending on the scenario, site sharing savings can account for up to 45% of the summated stand-alone costs of the cooperating operators for sites, RAN sharing up to 40% of the RAN costs and sharing including the core network up to 33% of total mobile network costs.

The savings in the case of roaming become even more pronounced in sparsely populated areas. In this case, the additional traffic for the roaming provider only generates a (small) fraction of the costs which the operator demanding roaming saves by not deploying its own network infrastructure there. The smaller the roaming proportion of traffic, the greater this relative cost saving is.

Conclusions for Switzerland

Our analysis of the characteristics of the different forms of network sharing in mobile networks, the international market and regulatory trends in this area, plus the market situation in Switzerland, leads us to the following conclusions and recommendations for Switzerland:

1. The paradigm of infrastructure competition is workable in Switzerland with three network operators independent of each other and with three country-wide mobile networks.

2. The workability of infrastructure competition would be greatly impaired if the number of network operators were to fall to two.

3. Despite the relevant infrastructure competition, the incumbent operator Swisscom has a dominant market position in the mobile market also. This is ongoing and does not seem to be contestable. This market asymmetry has an adverse effect on the efficiency of competition in the mobile market.

4. Although network sharing in Switzerland is essentially limited to the (lower) level of passive sharing, all three operators have established (almost) nationwide mobile networks. This applies also to the modern 4G technology generation.

5. As a result of more intensive network sharing, a lower level of costs could be achieved, in particular in the case of the two minor network operators. This is clearly highlighted by the results of our cost modelling. The existence of three nationwide networks in conjunction with only limited network sharing leads to a higher cost level in Switzerland. This, in conjunction with the structure of the market, is a key reason for the relatively high end-customer price level in Switzerland.

6. We are not arguing for enforcing or incentivising of network sharing by the legislator or the regulatory authority in Switzerland, particularly as this is not (currently) pursued by operators. It must remain a matter for the operators to take the necessary initiatives for this. However, we do recommend the authorisation of intensive active RAN sharing, if the cost pressure in the market increases and the profitable commercial operation of the two minor operators is endangered. In that case the current competitive market structure would also be endangered.

7. The authorisation of a similar wide-ranging network co-operation between two operators, possibly involving a joint venture for the operation of a uniform RAN represents a more competition-friendly market structure than the merger of two operators. This applies in particular if the co-operation model is subject to obligations, which counteract any (potential) impediments on competition.

8. Given the existing market structure in the Swiss mobile market, however, not every configuration of operators for network co-operation promotes competition. Only a network co-operation between the two minor operators promotes competition. In this way significant cost savings could be achieved and the relative cost gap in relation to the market-dominant provider could be reduced (significantly). This is clearly supported by the results of our cost modelling. Network co-operation with participation of the market-dominant provider, on the other hand, would further reinforce the already existing market asymmetries.

9. With regard to competition-ensuring conditions in the event of approval of comprehensive network co-operation, we are thinking in particular of an MVNO obligation. In this context, a highly competitive MVNO model envisages the provision of specific network capacity at capacity-based prices.

10. In accordance with the dominant behaviour of all regulatory authorities, we recommend not allowing any future network co-operation which includes the core network in addition to the RAN. This would have major adverse effects on the competitive independence of operators.

11. Extensive joint use of frequency spectrum is not compatible with the coverage obligations defined during spectrum assignment or the principles of infrastructure competition. Beyond the coverage obligation and in particular in order to improve coverage in rural regions, joint spectrum use could be permitted.

12. The Swiss regulator must also pay greater attention to network co-operation through virtualisation of network functions. These concepts will in any case become prevalent as 5G develops. In this context the definition of a network operator may have to be adapted in order to enforce legitimate regulatory interests.

13. During the upcoming revision of the Telecommunications Act, the regulations pertaining to network sharing may (and should) be formulated more clearly and more transparently.

14. So that the market players enjoy transparency concerning regulatory policy on network sharing and the prerequisites for approval of specific forms of network sharing, we recommend updating of the 2002 ComCom Notice. Indications for an update are made in our study, in particular in Section 6.4.

15. If the regulatory authority also wishes to authorise comprehensive network co-operation in certain market configurations – which we recommend – the conditions on RAN sharing should be formed more "liberal" than in the 2002 rules.

Convergence of the fixed network and mobile radio

With technological progress and the transition to all-IP-based networks, mobile radio networks and fixed networks are more and more growing together into a convergent world of communication. This applies to both the network side and the end-user side. The development of bundled products has been a feature of the market for some years. Here too, fixed and mobile networks are converging in terms of both products and services. Moreover, additional services are being included in bundles. The increasing importance of bundled products has significant effects on the development of the market and on competition. For example, it is becoming more difficult for mobile network operators without a fixed network to survive in the market.

Bundled products have both pros and cons for the end-customers. In general the bundled services are offered at lower prices than the sum of the individual prices for these services. Depending on its features, bundling can also lead to end-customers having to purchase services in the bundle which have no added value for them. Pricing and product transparency can also be reduced by bundling.

In Switzerland, three country-wide telecommunications service providers are established in such a way that they can offer bundled products featuring broadband internet access, telephony, TV and mobile services.

An evaluation of the competitive effects of bundled products in Switzerland and of the effectiveness of access regulation of wholesale products, where Swisscom dominates the market, and also of the regulations on price discrimination requires a detailed market analysis which is beyond the scope of this study. Nevertheless it is possible to highlight some key points of reference which can be derived from the evolution of the market to date.

The increasing importance of bundled products has a detrimental effect for example on the demand for unbundled access lines, as unbundling technology is not suitable everywhere for the bundling of telephony, internet and digital television. Alternative competitors without their own infrastructure are therefore dependent on an (unregulated) wholesale VDSL or fibre product, in order to be able to offer bundled products which include television. The question of access to a regulated VDSL wholesale product and to regulated unbundled fibre subscriber lines is therefore definitely relevant.

In view of the lengthy duration of *ex-post* procedures, at a first glance the question arises to which extent the *ex-ante* regulation of markets with one market-dominant network operator should be considered as a regulatory option. For improving competition between telecommunications service providers, it is in general highly advantageous if the measures promoting competition come into force in due time. If they have an impact just some years later, they will not have any effect on the market and in the final analysis only generate distributional effects between the companies involved.